RELIANCE ELECTRIC

DC3R Isolation Option Board
User Guide

Instruction Manual D2-3454

Rockwell Automation

The information in this manual is subject to change without notice.

Throughout this manual, the following notes are used to alert you to safety considerations:

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

IMPORTANT: Identifies information that is critical for successful application and understanding of the product.

ATTENTION: Only qualified personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, and/or service this equipment. Read and understand this instruction manual in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The user is responsible for conforming with all applicable local and national codes. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The control circuit is at line potential when the drive is energized. Use a non-metallic screwdriver when making adjustments to the circuit board potentiometers. Exercise extreme caution as hazardous voltage exists. Failure to observe these precautions could result in severe bodily injury of loss of life.

ATTENTION: It is possible for a drive to run at full speed as a result of a component failure. Please ensure that a master switch has been placed in the AC line to stop the drive in an emergency.

ATTENTION: Reduce the chance of an electrical fire, shock, or explosion by proper grounding, over-current protection, thermal protection and enclosure. Follow sound maintenance procedures.

ATTENTION: This Drive contains ESD (Electric Static Discharge) sensitive parts and assemblies, Static control precautions are required when installing, testing, servicing, or repairing this assembly. Failure to observe these precautions could result in damage to, or destruction of, the equipment.

Corcom is a trademark of CII Technologies.
Reliance is a trademark of Rockwell International Corporation.

©1999 Rockwell International Corporation.

ATTENTION: Starting and stopping with the inhibit terminal pins does not disconnect AC power in the stop position. A hardwired AC power disconnection switch must be mounted in close proximity to the operator's start/stop controls. This is required, as the DC3 drive does not have an armature loop contactor. A single fault like a power device short may cause motor rotation when in the stop mode. The user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

Contents

Introduction **1**

Specifications **2**

Dimensions **3**

Connections 5

Isolation option board connections 5

Installation **5**

Input voltage select switch 6

Speed adjust potentiometer connections 7

Polarity reversal switch connections 8

Calibration **10**

Voltage input signal calibration 11

Calibration procedure 11

Current input signal calibration 13

Calibration procedure: 13

Troubleshooting **15**

Before troubleshooting 15

Illustrations

Figure 1. Isolation Option Board Dimensions 3
Figure 2. Isolation Option Board Mounted on a Regenerative Drive 4
Figure 3. Isolation Option Board Connections 5
Figure 4. Input Voltage Select Switch 6
Figure 5. Speed Adjust Potentiometer Connections 7
Figure 6. Polarity Reversal Switch Connection 8
Figure 7. Open Collector PNP Transistor 9
Figure 8. Polarity Reversal Using NPN Transistor
Used as a Polarity Reversal Switch 9
Figure 9. Calibration Trimpot and DIP Switch Layout 10

Introduction

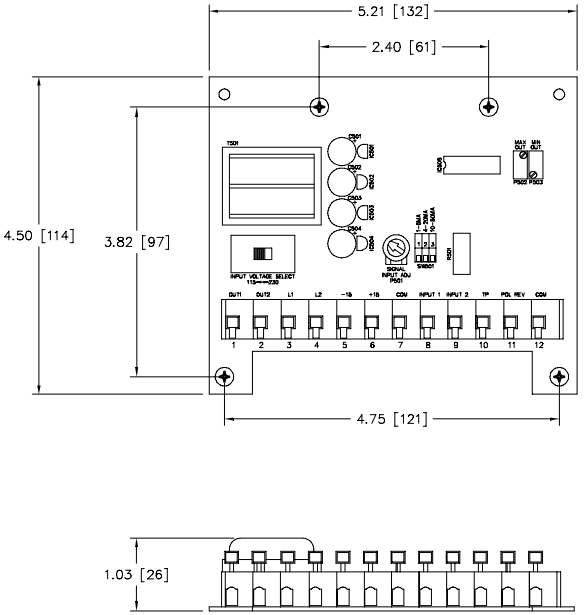
The isolation option board allows regenerative drives to accept a grounded or floating DC voltage or current signal.

This manual contains specifications, installation procedures, connections, and calibration procedures for the isolation option board. Refer to your regenerative drive user’s manual for additional installation, operation, and troubleshooting procedures.

Specifications

Power Requirements	
Line input	115VAC/230 VAC, 50/60 Hz, single phase
Input Signal Ranges	
Voltage signal, narrow range	–25 to +25 VDC
Voltage signal, wide range	–250 to +250 VDC
Current signal	1–5 mADC, 4–20 mADC, 10–50 mADC
Input Impedance	
Voltage signal	>25K ohms
Current signal, 1–5 mADC	1K ohms
Current signal, 4–20 mADC	235 ohms
Current signal, 10–50 mADC	100 ohms
Output	
Voltage range, max	–10 to +10 VDC
Linearity	0.01%
Safety Certification	UL Listed Component
	cUL Listed Component
	CE Approved Component

Dimensions



ALL DIMENSIONS IN INCHES [MILLIMETERS]

Figure 1. Isolation Option Board Dimensions

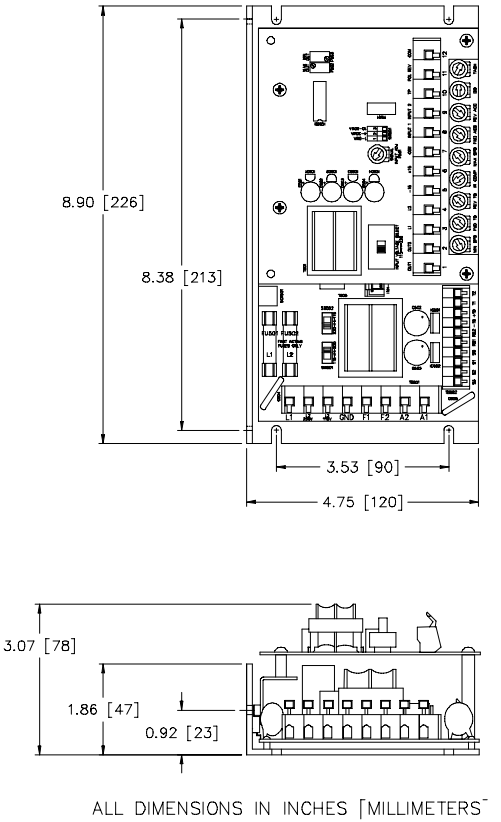


Figure 2. Isolation Option Board Mounted on a Regenerative Drive

Installation

ATTENTION: Only qualified personnel familiar with the constuction and operation of this equipment and the hazards involved should install, adjust, operate, and/or service this equipment. Read and understand this instruction manual in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury and loss of life.

ATTENTION: The user is responsible for conforming with all applicable local and national codes. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: This Drive contains ESD (Electric Static Discharge) sensitive parts and assemblies, Static control precautions are required when installing, testing, servicing, or repairing this assembly. Failure to observe these precautions could result in damage to, or destruction of, the equipment.

Connections

Isolation option board connections

See Figure 3 for isolation option board connections. Isolation option board terminals 1 through 4 are prewired on DC3R drives.

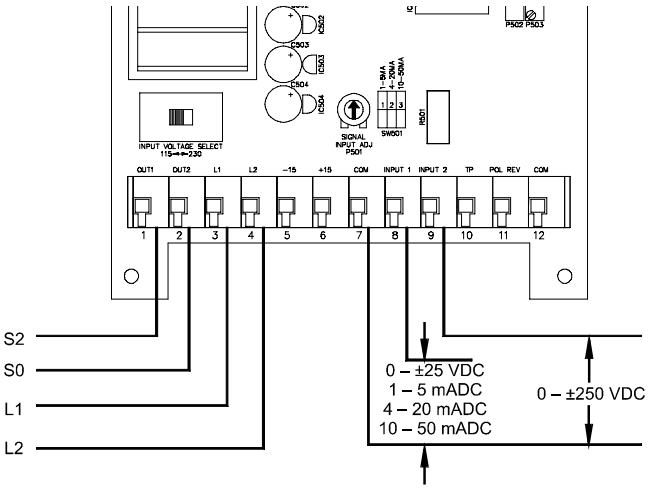


Figure 3. Isolation Option Board Connections

Input voltage select switch

ATTENTION: Change slide switch settings only when the drive is disconnected from the AC line voltage. Make sure line voltage is set to its correct position. If the switch is improperly set to a lower voltage position, the motor will not run at full voltage and may cause transformer damage. If the switch is improperly set to a higher voltage position, the motor will overspeed, which may cause motor damage.

Set the input voltage select switch to 115 or 230 to match the AC line voltage. See Figure 4 for switch location.

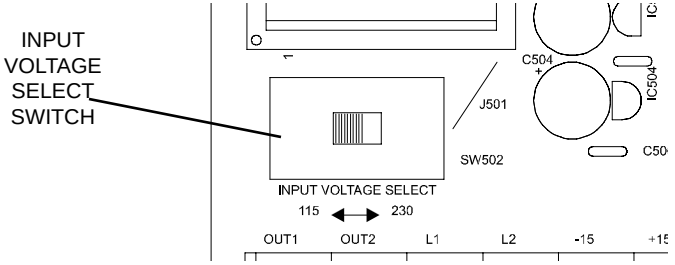


Figure 4. Input Voltage Select Switch

Speed adjust potentiometer connections

ATTENTION: Because the reference potentiometer is connected through the regulator to the armature power circuit, its terminals are at line potential. Use a potentiometer that has a insulating shaft to insulate the operator knob from this power circuit and that is capable of withstanding Hi-pot tests at 2000 Volts DC for one minute. Failure to observe this precaution could result in severe bodily injury or loss of life.

The isolation option board can be hooked up to speed adjust potentiometer instead of following an external current or voltage signal. To control a motor in one direction, hook up the speed adjust potentiometer as shown in Figure 5(a); for bidirectional control, use the connection in Figure 5(b).

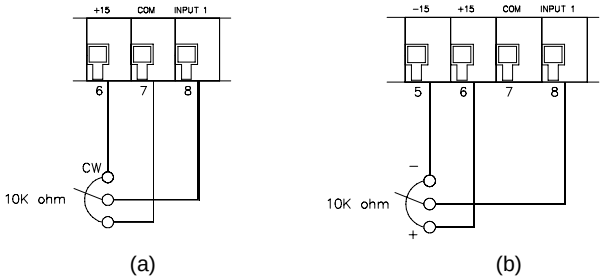


Figure 5. Speed Adjust Potentiometer Connections for (a) Unidirectional Control and (b) Bidirectional Control

Polarity reversal switch connections

To reverse the output voltage polarity without changing the input voltage (or current) polarity, connect POL REV to COM (terminal 11 to terminal 12). A single-pole, single-throw switch can be used as a polarity reversal switch (Figure 6). Close the switch to reverse polarity. Open the switch to return the output voltage back to its original polarity.

An open collector PNP transistor may also be used to reverse the output voltage polarity (Figure 7). Another alternative is to use an NPN transistor as shown in Figure 11 to reverse the output voltage polarity.

IMPORTANT: If using an NPN transistor, additional components must be installed. Install a 39K ohm resistor in series between Terminal 11 and the transistor collector, and a 10K ohm resistor between Terminal 6 and the transistor collector as shown in Figure 8.

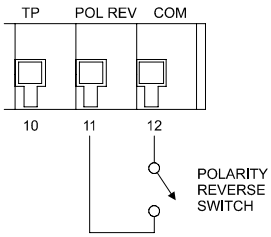


Figure 6. Polarity Reversal Switch Connection

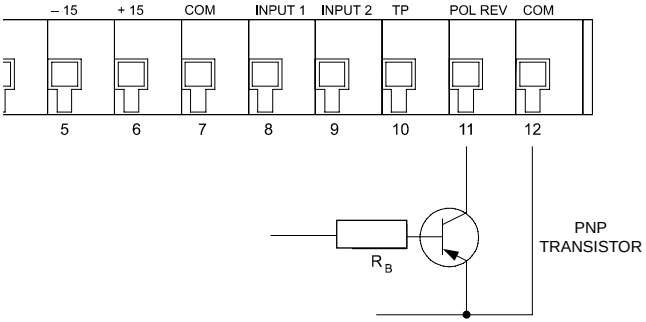


Figure 7. Open Collector PNP Transistor
Used as a Polarity Reversal Switch

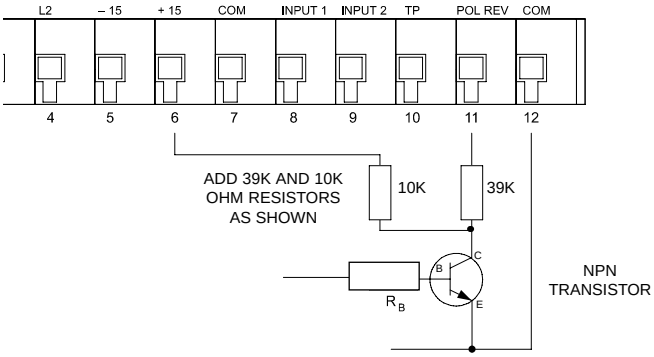


Figure 8. Polarity Reversal Using NPN Transistor

Calibration

ATTENTION: The following adjustments are made with power on. Exercise extreme caution as hazardous voltage exists. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The control circuit is at line potential when the drive is energized. Use a non-metallic screwdriver when making adjustments to the circuit board potentiometers. Exercise extreme caution as hazardous voltage exists. Failure to observe these precautions could result in severe bodily injury or loss of life.

All adjustments increase with CW rotation, and decrease with CCW rotation. Use a non-metallic screwdriver for calibration. Each trimpot is identified on the printed circuit board.

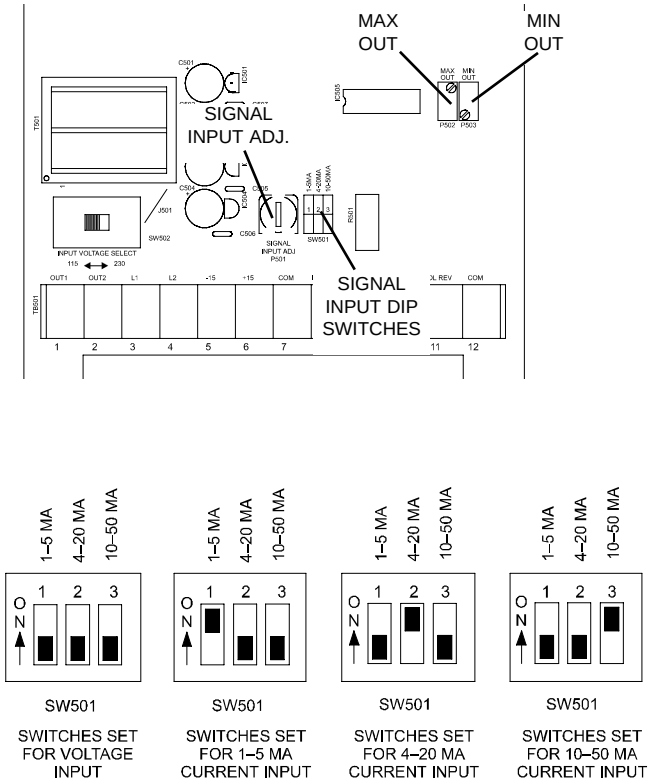


Figure 9. Calibration Trimpot and DIP Switch Layout

Voltage input signal calibration

The following maximum and minimum voltages should be known:

V_{imin} – Minimum voltage input signal.
V_{omin} – Minimum voltage output signal.
V_{imax} – Maximum voltage input signal.
V_{omax} – Maximum voltage output signal.

V_{imin} and V_{imax} is the voltage applied across terminals 7 and 8 (COM and INPUT 1) if the voltage input signal range is 0 – ±25 VDC, or across terminals 7 and 9 (COM and INPUT 2) if the voltage input signal range is 0 – ±250 VDC. V_{omin} and V_{omax} is the voltage across terminals 1 and 2 (OUT1 AND OUT2).

Calibration procedure

ATTENTION: The control circuit is at line potential when the drive is energized. Use a non-metallic screwdriver when making adjustments to the circuit board potentiometers. Exercise extreme caution as hazardous voltage exists. Failure to observe these precautions could result in severe bodily injury of loss of life.

ATTENTION: The DC3 drive is intended to operate at a predetermined minimum speed. If the application requires zero speed operation, the user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

Use a voltmeter for voltage measurements.

1. Switch all three of the SW501 DIP switches OFF as shown in Figure 9 (page 12).
2. Connect the signal input as follows:
   a. Connect signal common (–) to COM (terminal 7).
   b. For 0 ± 25 VDC input signal, connect the signal positive (+) to INPUT 1 (terminal 8); for 0 ± 250 VDC input signal, connect the signal positive to INPUT 2 (terminal 9).
3. Adjust the regenerative drive's MIN SPD trimpot full CCW and the MAX SPD trimpot full CW.
4. Apply AC line voltage and voltage input signal.
5. Set the voltage input signal to V_{imin}.
6. Adjust the MIN OUT trimmer potentiometer (P503) so that the output voltage is V_{omin}.

7. Set the voltage input signal to V_{imax}.
8. Calculate the test point voltage, V_{tp}:

$$V_{tp} = \frac{(V_{imax})\,(m)}{2}$$

where

$$m = \frac{V_{omax} - V_{omin}}{V_{imax} - V_{imin}}$$

9. Adjust the SIGNAL INPUT ADJ trimmer potentiometer (P501) so that the voltage from COM to TP (terminal 7 to 10) is V_{tp}.
10. Adjust the MAX OUT trimmer potentiometer (P502) so that the voltage output signal is V_{omax}.
11. Repeat steps 4, 5, 6, 7, 9, and 10. Use the same voltage values that you previously calculated.

Current input signal calibration

The following minimum and maximum values should be known:

V_{omax} - Maximum voltage output signal
V_{omin} - Minimum voltage input signal
I_{imax} - Maximum current input signal
I_{imin} - Minimum current input signal

I_{imin} and I_{imax} is the current applied through terminals 8 and 9 (COM and INPUT 1). V_{omin} and V_{omax} is the voltage applied across terminals 1 and 2 (OUT1 and OUT2).

Calibration procedure:

ATTENTION: The control circuit is at line potential when the drive is energized. Use a non-metallic screwdriver when making adjustments to the circuit board potentiometers. Exercise extreme caution as hazardous voltage exists. Failure to observe these precautions could result in severe bodily injury of loss of life.

ATTENTION: The DC3 drive is intended to operate at a predetermined minimum speed. If the application requires zero speed operation, the user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

Use a voltmeter and ammeter for voltage and current measurements, respectively.

1. Switch only one of the SW501 DIP switches to the ON position (Figure 9, pg 12):
   DIP switch 1 ON for 1–5 mA,
   DIP switch 2 ON for 4–20 mA, or
   DIP switch 3 ON for 10–50 mA.
2. Connect (but do not power) the current input signal as follows:
   a. Connect the signal negative (–) to COM (terminal 7).
   b. Connect the signal positive (+) to INPUT 1 (terminal 8).
3. Adjust the regenerative drive's MIN SPD trimpot full CCW and the MAX SPD trimpot full CW.
4. Apply both the AC line voltage and the current input signal.
5. Set the current input signal to I_{imin}.
6. Adjust the MIN OUT trimmer potentiometer (P503) so that the output voltage is V_{omin}.
7. Set the current input signal to I_{imax}.
8. Calculate the test point voltage, V_{tp}:

$$V_{tp} = \frac{(I_{imax})\,(m)}{2}$$

where

$$m = \frac{V_{omax} - V_{omin}}{I_{imax} - I_{imin}}$$

9. Adjust the SIGNAL INPUT ADJ trimmer potentiometer (P501) so that the voltage from COM to TP (terminal 7 to terminal 10) is V_{tp}.
10. Adjust the MAX OUT trimmer potentiometer (P502) so that the output voltage is V_{omax}.
11. Repeat steps 4, 5, 6, 7, 9, and 10. Use the same voltage and current values that you previously calculated.

Troubleshooting

ATTENTION: Dangerous voltages exist on the isolation option board and regenerative drive when it is powered. When possible, disconnect the AC line voltage from the isolation option board and regenerative drive while troubleshooting. Be alert. High voltages can cause serious or fatal injury.

Before troubleshooting

Perform the following steps before starting any procedure in this section:

- Disconnect AC line voltage from the isolation option board adder board and regenerative drive.
- Check the isolation option board and drive closely for damaged components.
- Check that no conductive or other foreign material has become lodged on the printed circuit board.
- Verify that every connection is correct and in good condition.
- Verify that there are no short circuits or grounded connections.
- Check that the input voltage select switch is set to either 115 or 230 to match the AC line voltage.
- Check that the regenerative drive's rated armature and field outputs are consistent with the motor ratings.

If there is no output

1. Measure the voltage output signal across terminals 1 and 2 (OUT1 and OUT2). If there is a DC voltage present and there is no DC motor output, then check the connections to the regenerative drive that it is connected to.
2. Check the voltage at terminals 3 and 4 (L1 and L2). If there is no voltage then check the connections to the regenerative drive that it is connected to.
3. Check that the isolation option board board is receiving a voltage (or current) input signal.
4. Check to see that the signal input ADJ trimmer potentiometer (P501) is not set to the full CCW position.

If the unit is running at full speed

1. Check that the voltage output signal across terminals 1 and 2 (OUT1 and OUT2) changes when the voltage (or current) input signal changes.
2. Check the wiring to the isolation option board board to the regenerative drive.

If the unit runs too slow or too fast

1. Check SW501 positions.
2. Check MIN SPD and MAX SPD trimpot calibrations.

If unit does not reverse

Check POL REV and COM connections.

Reach us now at www.rockwellautomation.com

Wherever you need us, Rockwell Automation brings together leading brands in industrial automation including Allen-Bradley controls, Reliance Electric power transmission products, Dodge mechanical power transmission components, and Rockwell Software. Rockwell Automation's unique, flexible approach to helping customers achieve a competitive advantage is supported by thousands of authorized partners, distributors and system integrators around the world.

Americas Headquarters, 1201 South Second Street, Milwaukee, WI 53204, USA, Tel: (1) 414 382-2000, Fax: (1) 414 382-4444
European Headquarters SA/NV, avenue Herrmann Debroux, 46, 1160 Brussels, Belgium, Tel: (32) 2 663 06 00, Fax: (32) 2 663 06 40
Asia Pacific Headquarters, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Rockwell Automation

Publication D2-3454 - December 1999 ©1999 Rockwell International Corporation. All rights reserved. Printed in USA